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GAS BURNER CONTROL

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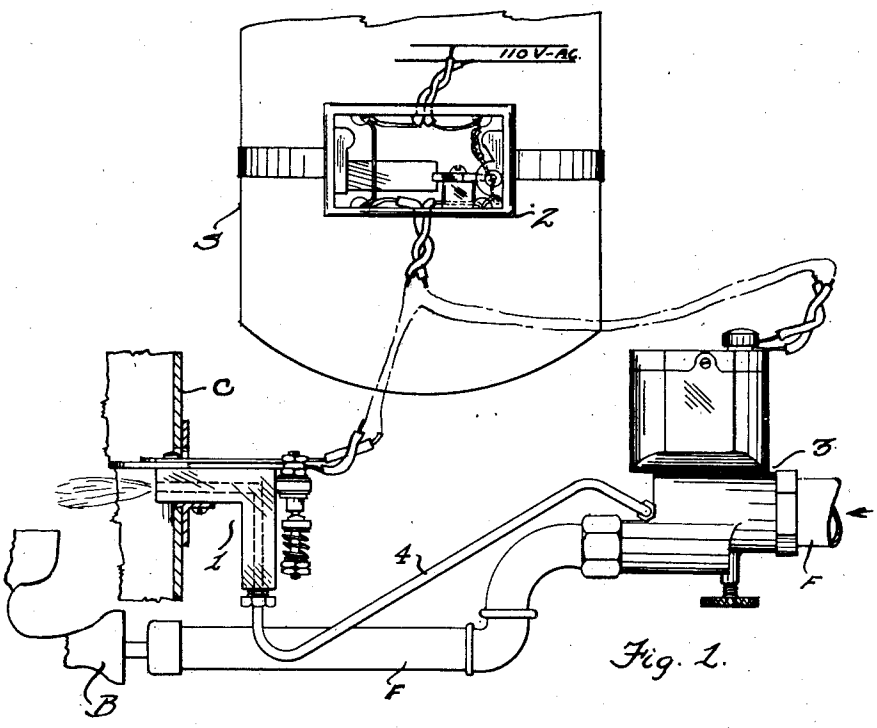


Fig. 1.

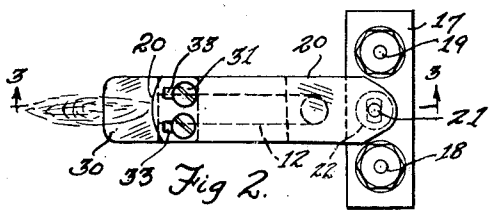


Fig 2.

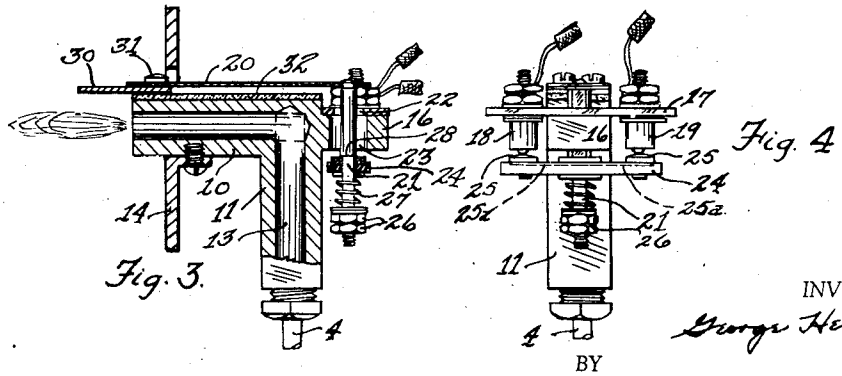


Fig. 3.

Fig. 4

INVENTOR.
George Herbster,
BY
John Harrison Kennard,
his ATTORNEY.

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GAS BURNER CONTROL

George Herbster, Cleveland, Ohio

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2 Claims. (Cl. 158—117.1)

This invention relates to gas burner controls and particularly to an automatic safety control for domestic hot water tank heaters and the like.

One of the principal objects of the present invention is to provide an apparatus which may readily be installed in present types of hot water tank heaters for stopping completely the supply of gas to the service burner of the heater consequent upon extinguishment of a safety pilot burner associated therewith, and upon heating of the water in the tank to a predetermined temperature.

A more specific object is to provide a new and improved safety pilot light which is more quickly responsive to changes in the temperature to which it is subjected and in which the various electrical switch connections are so formed that proper alignment and efficient electrical contact are assured.

Another specific object is to provide a solenoid operated valve for use directly in connection with the usual household alternating current and in which the noises resulting from alternating current are greatly reduced or eliminated.

Another object is to provide a valve of this character which, upon failure of the electrical supply for any reason, will operate promptly to cut off the supply of gas to the service burner.

Another object is to provide a thermostatic control which is promptly responsive but protected from direct heat and impingement of the pilot flame.

Another specific object is to provide, for controlling the valve, a tank thermostat which may be installed readily upon a hot water tank and in which efficient and prompt making and breaking of an electrical circuit is effected.

Other objects and advantages will become apparent in the following specification wherein reference is made to the drawing in which

Fig. 1 is a side elevation showing the component parts of the invention and their operative position with respect to a hot water tank heater and hot water storage tank;

Fig. 2 is a top plan view of the pilot light of the present invention;

Fig. 3 is a cross sectional view taken on a plane indicated by the line 3—3 of Fig. 2;

Fig. 4 is a right hand end elevation of the pilot illustrated in Figs. 2 and 3;

For the purposes of illustration the features of the present invention are shown in connection with a domestic hot water tank heater and storage tank, their application to other uses being readily apparent therefrom.

Referring to Fig. 1, a storage tank S is connected in the usual manner, not shown, to a hot water tank heater, which is enclosed in a casing C and heated by a service burner B, all in a manner well known in the art, fuel being supplied to the burner B through a gas feed conduit F.

The present apparatus includes a pilot burner 1, a tank thermostat 2, and a solenoid operated cut off valve 3, the valve 3 being connected in the conduit F so that all gas passing to the burner B must pass through the valve. For mounting the pilot 1, a suitable passage is provided through the side wall of the casing C and the pilot is secured to the casing C so as to project a flame into igniting relation to the service burner B. Gas is supplied to the pilot 1 through a feed conduit 4 which communicates with the interior of the valve body 3 in advance of the closure elements so as to receive a supply of gas from the feed line F both when the valve 3 is open and closed. The pilot 1 is electrically connected in series to the solenoid coil of the cut off valve 3, and to the usual 110 volt alternating household current, the thermostat 2 being connected in series with the pilot and valve.

Referring specifically to the pilot burner 1, the pilot burner body is preferably formed from a single casting having a main body portion 10 and a depending body portion 11, the latter being connected to the feed conduit 4. Both the depending portion 11 and the body 10 are provided with axial ducts 12 and 13 respectively communicating with each other interiorly of the body, the duct 12 opening at the front end of the body for discharging a stream of fuel substantially horizontally over or in igniting relation to the service burner B. For mounting the body on the casing C, a suitable bracket 14 is provided, the bracket being secured to the pilot body, as illustrated, or formed integral therewith. The bracket 14, in turn, is provided with suitable bolt holes, not shown, for securing the pilot on the casing C in the position illustrated. At the end of the body portion 10, opposite to the discharge end of the duct 12, is a protuberance 16 on which is mounted a plate 17 extending transversely of the body and protruding at each of its ends therebeyond.

Mounted on the protruding ends of the plate 17 and electrically insulated therefrom are stationary contactors 18 and 19 respectively, each of which is connected to one wire of the electrical

circuit of the apparatus. Carried by one of its ends on the body portion 10 is a bi-metallic thermostatic lever 20, which extends from its point of support longitudinally of the body portion 10 with its free end in overhanging relation to the protuberance 16. The lever 20 is preferably a flat strip arranged with its flat face substantially horizontal so as to swing in a vertical path upon heating and cooling. Secured to the free end of the lever 20 is a depending supporting pin 21 which extends from the lever through suitable aligned openings 22 and 23 in the protuberance 16 and beyond the under surface thereof. Mounted on the protruding end of the pin 21 in spaced relation below the protuberance 16 is a transversely extending bridge of insulating material which carries on its upper face near each end electrical contactors 25, the contactors 25 being electrically collected to each other by a suitable conducter 25a, and being complementary to contactors 18 and 19, the assembly forming a bridge contactor 24.

The bridge contactor 24 is preferably free to rotate about the axis of the pin 21 as well as to rock transversely and forwardly and rearwardly thereon. The pin 21 protrudes beyond the contactor 24 and is threaded at the end to receive adjusting nuts 26 between which and the contactor 24 a spring 27 is provided for urging the contactor toward the complementary contactors 18 and 19. A suitable shoulder 28 is provided on the pin for limiting this movement of the contactor 24 relative to the pin in such a position that when the thermostatic lever is entirely cool or at a predetermined low temperature, the bridging contactor will be out of contact relation with the contactors 18 and 19. The pin 21 and contactor 24 are so related to the depending portion 11 of the body that the body forms an abutment which limits turning of the contactor about the axis of the pin 21. In this manner, the contactor 24 is mounted for limited universal movement.

By this arrangement the two wires necessary for an electrical circuit may be connected to the stationary contactors 18 and 19 and no movable wires with well known disadvantages are necessary. Due to the resiliency of the spring 27, it is apparent that the movement of the lever 20 in response to temperature changes is not arrested when the contact relation is effected. Consequently, binding of the lever and resultant twisting and stressing are eliminated. Again, by changing the position of the adjusting nuts 26 a certain adjustment of the temperatures at which contact will be made and broken may be effected. More important, however, is the fact that the misalignment of the contactors 25 with the respective contactors 18 and 19 is eliminated as the contactor 24 may shift with its universal limited movement to a position to insure full and complete contact of both contactors 25 with the contactors 18 and 19. The engagement of either one of the contactors 25 with its complementary stationary contactor cannot prevent proper engagement of the others. Furthermore, both contactors 25 will be under equal contact pressure.

In order to assure prompt response of the lever 20 to the pilot flame or to the temperature within the casing C and at the same time prevent damage thereto by undue heating, a heating conducting shield 30 is provided, the shield preferably being of "Monel" or other high heat resistant metal. The shield 30 is secured on the body portion 10 of the pilot and protrudes therefrom at the discharge end in overhanging or heating relation to the flame of the pilot burner. This metal shield can well withstand direct impingement of the flame or extremely high heat within the casing without deterioration. The lever 20, in turn, is connected to the body portion 10 in spaced relation thereabove so as to permit free circulation of air thereabout. The fixed end of the lever, preferably remote from the pin 21 as illustrated, is fastened in heat conducting relationship, preferably tight face to face contact, to the shield 30. In the form illustrated, this is accomplished by securing the lever 20 and shield 30 together and into firm connecting relationship to the body portion 10 through suitable screws 31. The lever 20 terminates at the discharge end of the body so as not to be in the direct path of any flame but instead, subjected only to the heat conducted thereto by the shield 30. Since it is spaced from the body it is not delayed in its action by heat conducted thereinto from the body as would be the case were the lever lying in face to face contact with the top of the body. It is readily apparent that the mass of the body is such that a considerable delay in the action of the thermostat would be created if the body became heated to an appreciable extent and a large path of heat conductivity were provided between the lever and the body.

To further reduce the effect of the heated body on the thermostatic lever and also to prevent conduction of heat from the body to and from the shield 30 and thence to the lever, especially in cases requiring high temperature generation, a heat insulating shield 32 is provided along the top wall of the body, or about such other portions of the body as it appears desirable.

For effecting further adjustment of the thermostatic lever, it is provided at the portion contacting with the shield 30 with elongated slots 33 extending longitudinally of the lever. Thus by loosening the screws, the lever may be shifted longitudinally within certain limits to effect not only a change in the effective length of the lever but also in the area of contact between the lever and the shield, thus concurrently varying the effective length of the lever and the rate of heat conductivity thereinto.

The tank thermostat, to be more fully described hereinafter, is such as to make contact and therefore close the circuit at low temperatures and to break contact to open the circuit at a predetermined higher temperature. The solenoid valve, in turn, connected in the circuit as illustrated, opens when the circuit is energized and thus permits flow to the service burner, and closes for cutting off the supply of gas when the circuit is broken.

As illustrative of the operation of the structure and the relation of the pilot, let it be assumed that the hot water tank S is cool, the pilot light burning, the service burner B extinguished and the valve 3 closed. Upon cooling of the thermostatic lever 20, it swings upwardly bringing the bridging contactor 24 into contact with the contactors 18 and 19. Since the tank is cool, the thermostat 2 has operated to close the circuit therethrough. Upon this completion of the circuit by the pilot, the valve 3 opens, supplying gas to the burner B which is immediately ignited by the pilot flame. After the tank S becomes heated to the required degree, the thermostat 2 opens the circuit even though contactor 24 may be in contact relation with the contactors 18 and 19. Thereupon the valve 3 closes, stop-

ping the flow to the burner B. This condition continues until the tank thermostat 2 again cools, in which instance, the operation is reversed and gas again is introduced to the burner B. If the burner B is extinguished for any reason it is immediately re-ignited by the pilot. If, however, due to a low feed line pressure, drafts or other cause, the pilot is extinguished and so remains for a short interval, the thermostatic lever 20 cools and swings downwardly, opening the circuit through the contactors 18, 19 and 24, regardless of whether the tank thermostat is opened or closed. This action automatically cuts off the flow of gas to the service burner and prevents further discharge of gas therefrom until the pilot is relighted. Upon relighting the pilot, it burns for a few seconds to insure proper flame whereupon the lever 20 closes the circuit and the apparatus is again under the control of the tank thermostat. Again, assuming that, for some reason, the electrical power supply is temporarily discontinued, in such instance, the flow of gas to the service burner will be stopped. Thus complete safety is afforded under all conditions. However, the pilot will continue burning and, when the electric power supply is restored, the apparatus will again operate to supply gas to the service burner, if required. In case of long delay in suspension of electrical current supply, a manually controlled by-pass is provided in the valve 3 so that the apparatus temporarily can be placed entirely under manual control.

I claim:

1. In a pilot burner electric switch device for an electrically operated control mechanism, a pilot burner comprising a body having a fuel duct discharging from the body for sustaining a pilot flame, a thermostatic bi-metal lever carried by the body and responsive to heat from said flame, a pin carried by the lever and movable therewith and extending in the direction of travel of the portion of the lever by which it is carried, said body having a surface portion extending generally alongside the path of movement of the pin, a pair of stationary contactors carried by the body, a bridging contact means carried on the pin and mounted for rotation relative thereto and engageable with the stationary contactors when moved in one direction by the lever while within predetermined limits of rotation relative to the pin, said contactor means having a portion engageable by the said body surface portion for constraining rotation of the bridging contactor means within said predetermined limits of rotation.

2. In a pilot burner and electrical switch device for an electrically operated control mechanism, a pilot burner comprising a body having a fuel duct discharging from the body for sustaining a pilot flame, a thermostatic bi-metal lever carried by the body and responsive to heat from said flame, said lever being movable in response to temperature changes created by the pilot flame, an electrical contactor carried by the lever and mounted thereon for movement therewith and limited movement relative thereto along the path of movement of the lever, a complementary electrical contactor carried by the body and mounted in the path of travel of the movable contactor for contact therewith consequent upon movement of said lever a predetermined distance in one direction, spring means interposed between the lever and movable contactor and yieldably supporting said movable contactor on the lever for movement relative to the lever toward and away from the other contactor, and said spring, when unstressed, supporting said movable contactor in position relative to the lever out of contact with the said other contactor, and being compressed consequent upon engagement of said contactors when the lever moves to said predetermined position and therebeyond to reduce the stress on the lever.

GEORGE HERBSTER.